Version with Markings

to show changes made

as "flow identifier") data for identifying eash stream constituting the layered audiovisual, along with ientifier identifer (hereinafter, referred to as "control code") data for initiating or termianting the discard of packet data, to a DS (Differentiated Services) field value attached to the headers in the IP pakcet data, thereby IP-packetizing the layered audiovisual data for distribution.

Secondly, the present invention provides an IP packet data transfer apparatus, which adopts means for retaining flow identifier data of layered audiovisual data to be processed on the occurrence of congestion, along with control code data for initiating or terminating the discard of packet data, and when congestion occurs, performing discard initiation or termination on data having the flow identifier data indicating the layered audiovisual data retained, based on the control code data for performing the discard-initiating or -terminating operation of the packet data.

Thirdly, the present invention provides a server for shaping layered audiovisual data, which adopts means for retaning flow identifier data of layered audiovisual data to be processed when the sequence numbers in the layered packet data of the layered audiovisual data to be processed are discontinuous, along with control code data for initiating or terminating the discard of Ip packet data, and when any of the layered audiovisual streams

are adopted.

Sixly, the present invention provides an apparatus for performing MPLS-based packet data transfer, the apparatus adopting means for retaining labels to be processed upon congestion, and when congestion occurs, performing discard initiation or dicard termiantion of MPLS packet data.

Specifically, a packet data transfer method according to the present invention is a packet data transfer method for an IP (Internet Protocol) network or an MPLS (multiprotocol label switching) ~~(Multi-Protocol Label Switching)~~ network, comprising the steps of: retaining identifier (flow identifier) data for identifying data to be processed and identifier (control code) data for controlling the processing, in a packet data transfer apparatus having a plurality of I/O ports; receiving packet data provided with the flow identifier data and control code data; and in discarding packet data identified by the flow identifier data upon congestion in the packet data transfer apparatus, performing discard initiation or termination based on the control code data.

When the control code data is an initiating code, the discard initiation and discard termination of the packet data identified as packet data to be processed are conducted at packet data including predetermined control code (initiating code) data.

When the control code data is a terminating code, the discard initiation and discard termination of the packet data identified

invention is a data distribution scheme on an MPLS network, for distributing transmission data with flow identifier data for identifying the transmission data and control code data for controlling the discard initiation or termination of the transmission data in the middle of transmission arranged in a label field in the MPLS packet header thereof.

A packet data generating method according to the present invention is a packet data generating method for generating packet data from layered data consisting of a plurality of streams. Here, flow identifier data for identifying each layered data to be transmitted and control code data for initiating or terminating a discard operation when congestion occurs during transmission are added to each piece of the layered data partitioned by predetermined size, to form layered packet data. UDP (User Datagram Protocol) headers are added thereto for UDP packetization.

A data shaping method according to the present invention comprises the steps of: receiving a data ~~row~~ sequence which is distributed after created in such a manner that flow identifier data for identifying each layered data in layered data consisting of a plurality of streams, a sequence number to be consecutively given to data partitioned by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data partitioned by the

predetermined size to create layered packet data, followed by UDP packetization and IP packetization; reconstructing UDP packet data and the layered packet data from the IP packet data sequence row received, and discarding data from which UDP data is not reconstructible; checking for continuity in the sequence numbers of the reconstructed layered packet data by each flow identifier data; and when the sequence numbers are discontinuous, and if the control code data is control code data for initiating the discard operation, discarding subsequently-received layered packet data up to the one immediately preceding the layered packet data including the next control code data, and if the control code data is control code data for terminating the discard operation, discarding subsequently-received layered packet data up to the one including the next control code data, applying UDP packetization and IP packetization to following layered packet data, and distributing the resultant to the same destination as that at reception.

A data shaping apparatus according to the present invention comprises: means for receiving data created in such a manner that flow identifier data for identifying each layered data in layered data consisting of a plurality of streams, a sequence number to be consecutively given to data partitioned by predetermined size, and control code data for initiating or terminating a discard operation of each layered data are added to each layered data

that the duplication and transmission controller 71 analyzes the DS value in the IP header. The duplication and transmission controller 71 previously stores and retains the flow identifier data, duplication-initiating control code data, and duplication-terminating control code data of the IP packet data to create a duplication of in multicast distribution. Here, description will be given with the assumption that the flow to duplicate is the I-frame higher spatial frequency component (flow identifier data 0x5). ~~The specifications are as follows:~~ The creation of a packet data duplication is initiated at packet data including the control code data of 0xD. Flows under the duplication creation and distribution are flagged as being duplicated, and the flag is stored and retained in the duplication and transmission controller 71. When the creation of the duplication is no longer required, the creation of the duplication is terminated at packet data including the control code data of 0xD. That is, in initiating to create a duplication, the duplication creation is held back as long as packet data including the DS value of 0x5C is received. The duplication creation is initiated after the reception of IP packet data with 0x5D. The duplication and transmission controller 71 also controls the duplicator 73 so that when the duplicating-creating flag is set on and the creation of the duplication is no longer required, the duplication creation is not terminated as long as packet data

described in Fig. 3 are attached to the individual pieces of layered data (step 304).

(6) UDP headers are added to the layered-header-added layered packet data to constitute UDP packet data (step 305).

(7) The UDP packet data is divided into divided data, to which IP headers described in Fig. 3 are added to constitute IP packet data (step 306).

(8) The IP-packetized data is distributed from the output unit 156 (step 307).

The foregoing is the audiovisual distribution flow to be performed by the CPU 152 in the audiovisual distribution apparatus 150. While the present embodiment has been described in conjunction with the distribution of layered data using MPEG-1/2 coding as shown in Fig. 3, MPEG-4 coding may be used as the coding scheme. The MPEG-4 coding is an object-by-object coding. Therefore, when flow identifier data and control code data are added to each object for IP packet distribution, the selective data transmission/discard and duplication transmission performed under the MPEG-1/2 become possible.

Fig. 15 shows a configuration in which IP packet data is converted into MPLS (multiprotocol label switching) ~~(Multi-Protocol Label Switching)~~ packet data, and the converted MPLS packet data is transmitted through an MPLS network and then reconverted into IP packet data for transmission. In Fig. 15, the areas 75 and 77 represent IP networks, and the

FIG. 15

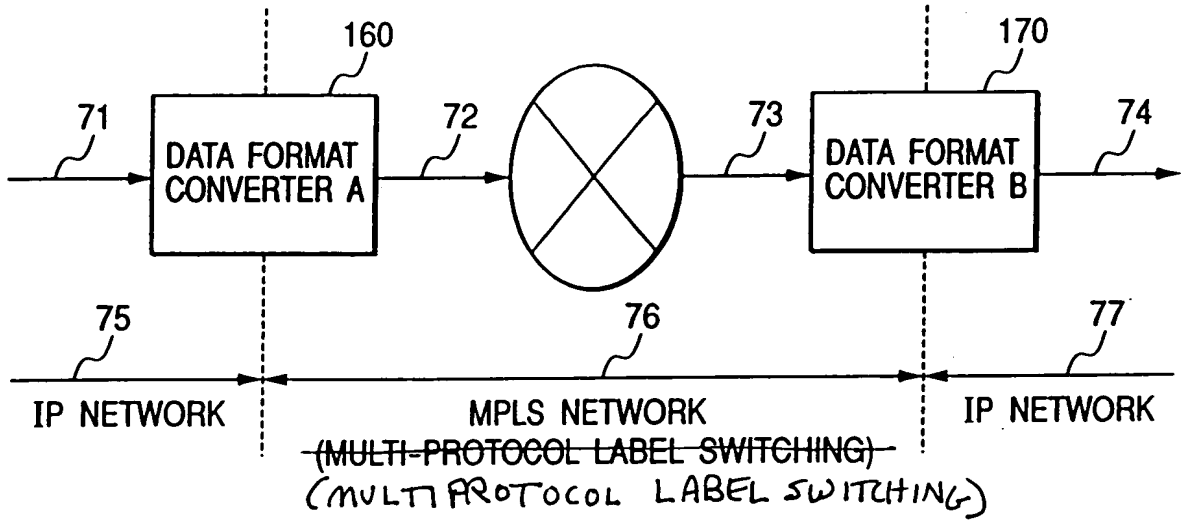
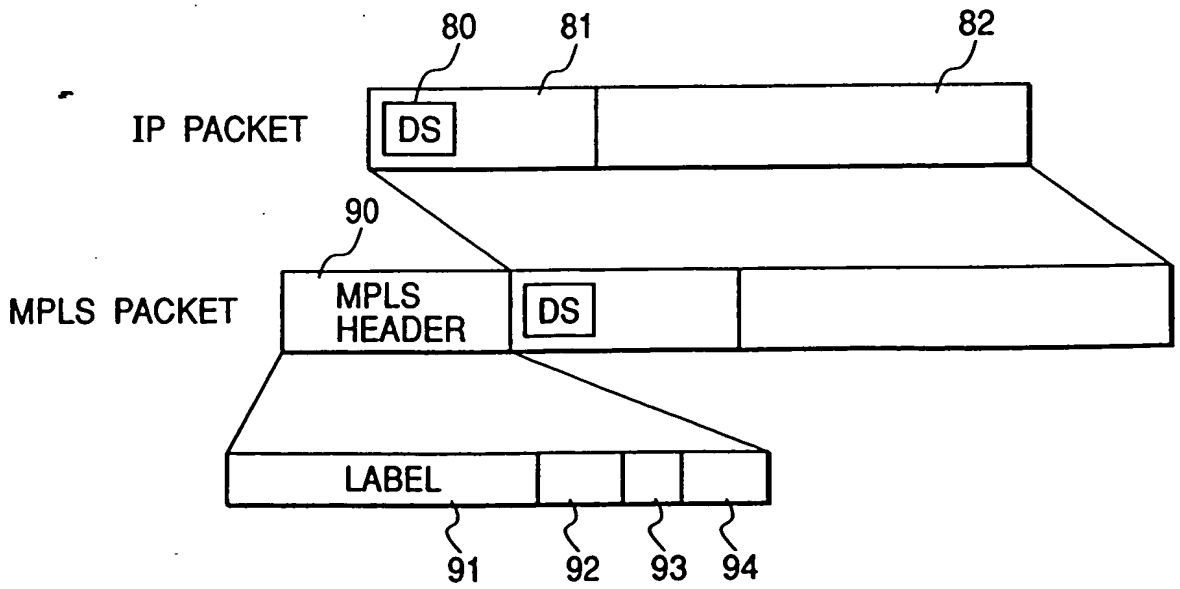

160
170
71
DATA FORMAT CONVERTER A
72
73
DATA FORMAT CONVERTER B
74
75
76
77
IP NETWORK
MPLS NETWORK
(MULTI-PROTOCOL LABEL SWITCHING)
(MULTI PROTOCOL LABEL SWITCHING)
IP NETWORK

FIG. 16


80
81
82
IP PACKET
DS
90
MPLS PACKET
MPLS HEADER
DS
LABEL
91
92
93
94